University of Sargodha

ADP / BS 3rd Semester Examination 2026

Subject: Mathematics **Paper: Calculus-III (MATH-5107/MATH-5106)**

Time Allowed: 2:30 Hours **Maximum Marks: 60**

Note: Objective Part is Compulsory. Attempt any three Question form Subjective Part.

Objective Part (Compulsory)

Q.1. Write short answers of the following in 2-3 lines each on your answer sheet. (2*12)

i. Find the vector projection of u onto v if $u = 2\hat{\imath} + 2\hat{\jmath} + \hat{k}, v = 2\hat{\imath} + 10\hat{\jmath} - 11\hat{k}$.

ii. Find the point in which the line $x = 1 - t, y = 3t,\ z = 1 + t$ meets the plane $2x - y + 3z = 6$

iii. Find a function $f(x, y)$ whose partial derivatives are given as $\frac{\partial f}{\partial x} = \frac{2y}{(x+y)^2}$, $\frac{\partial f}{\partial y} = \frac{2x}{(x+y)^2}$.

iv. Define Torsion.

v. Write tangential and normal components of acceleration.

vi. Define Critical point.

vii. Evaluate $\lim_{(x,y)\to(0,0)} \frac{x^3-y^3}{x^2+y^2}$.

viii. Evaluate $\int \vec{F}.d\vec{r}$ where $\vec{F}(x, y, z) = z\hat{\imath} + xy\hat{\jmath} - y^2\hat{k}$ along the curve C given by $\vec{r}(t) = t^2\hat{\imath} + t\hat{\jmath} + \sqrt{t}\hat{k},\ \ 0 \le t \le 1$.

ix. Find $\frac{dy}{dx}$, if $3x^2 - y^2 + x^3 = 0$, by using partial derivatives.

x. Write properties of directional derivative.

xi. Evaluate $\int_0^2 \int_0^1 \frac{xy^3}{x^2+1} dxdy$.

xii. If $\vec{F}$ is a vector field then prove that $div(curl\vec{F}) = 0$.

Subjective Part (3*12)

Q.2. (a) Examine $f(x, y) = 2x^2 - 4x + xy^2 - 1$ for relative extrema.

(b) Determine a vector function which has $(3cos3t)\hat{\imath} + (3sin3t)\hat{\jmath} + 4\hat{k}$ as its derivative and $\hat{\imath} + \hat{\jmath} + \hat{k}$ as value at $t = \pi$.

Q.3. (a) If $(x, y, z, w) = \frac{xy}{z+w}$, show that $f_{xyzw} = \frac{2}{(z+w)^3}$.

(b) State and prove Divergence Theorem.

Q.4. (a) Find the vector equation of the line through $5\hat{\imath} + \hat{\jmath} - 7\hat{k}$ and parallel to $2\hat{\imath} - \hat{\jmath} + 2\hat{k}$.

(b) Evaluate $\lim_{(x,y)\to(1,1)} \frac{x^2-y^2}{x-y}$.

Q.5. (a) Find the point (x, y, z) on the plane $-x^2 - z^2 + y = 2$ that is closest to the origin.

(b) Evaluate the integral $\int_0^{\sqrt{2}} \int_0^{3y} \int_{x^2+3y^2}^{8-x^2-y^2} dzdxdy$.

Q.6. (a) Find equation of plane passing through point $P(1,5,4)$ and perpendicular to the line $x = 1 + 7t, y = t,\ z = 23t$.

(b) Find TNB and Curvature of the given curve $\vec{r}(t) = (6sin2t)\hat{\imath} + (6cos2t)\hat{\jmath} + 5t\hat{k}$, at $t = \frac{\pi}{4}$.

University of Sargodha

ADP / BS 3rd Semester Examination 2026

Subject: Mathematics **Paper: Algebra-I (MATH-5107/ MATH -5108)**

Time Allowed: 2:30 Hours **Maximum Marks: 60**

Note: Objective Part is Compulsory. Attempt any three Question form Subjective Part.

Objective Part (Compulsory)

Q.1. Write short answers of the following in 2-3 lines each on your answer sheet. (2*12)

i. Define symmetric Group.
ii. Prove that the subgroup of cyclic group is cyclic.
iii. Define index of a group.
iv. Define permutation of a group.
v. Show that $(S_3,\cdot)$ is a non-abelian group.
vi. Define center of a group.
vii. Define homomorphism.
viii. Define Derive group.
ix. What is self conjugate?
x. Let G be an abelian group. Then prove that each subgroup of G is normal in G.
xi. Define endomorphism.
xii. Define transposition.

Subjective Part (3*12)

Q.2. State and prove third isomorphism theorem.

Q.3. Prove that an abelian group G of order n is cyclic if and only if it has exponent n.

Q.4. Let H, be two subgroups of a group G. Then prove that the collection Ω of all double cosets HaK, $a \in G$ is a partition of G.

Q.5. State and prove Langrange's theorem.

Q.6. Every permutation of degree n can be expressed as a product of cyclic permutations acting on mutually disjoint sets.

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ADP/ BS 3rd Semester Examination 2026

Subject: Mathematics **Paper: Ordinary Differential Equations(MATH-5109)**

Time Allowed: 2:30 Hours **Maximum Marks: 60**

Note: Objective Part is Compulsory. Attempt any three Question form Subjective Part.

Objective Part (Compulsory)

Q.1. Write short answers of the following in 2-3 lines each on your answer sheet. (2*12)

i. Bring the DE $4x\frac{dy}{dx} + y = x$ in the normal form.
ii. Define exact differential equation.
iii. Define trivial solution.
iv. Verify that ~~$y = \tan x$~~ is the solution of the DE ~~$y = 25 + y^2$~~. $y = 5\tan 5x$ is solution of $y' = 25 + y^2$.
v. Solve the separable equation $\frac{dy}{dx} = -\frac{x}{y}$
vi. Write down the roots of the equation $y''' + 3y'' - 4y = 0$
vii. Write down the trial particular solution y_p for $g(x) = [(x^2 + 2)\sin x]e^{2x}$.
viii. Find a linear differential operator that annihilates the function $13x + 9x^2 - \sin 4x$.
ix. Define an ordinary point.
x. Write down the Legendre's equation of order n.
xi. Determine whether the given DE is exact? $(x^2 - y^2)dx + (x^2 - 2xy)dy = 0$.
xii. Write the general solution of the Bessel's equation: $x^2y'' + xy' + \left(x^2 - \frac{1}{9}\right)y = 0$.

Subjective Part (3*12)

Q.2. a) Solve $x\frac{dy}{dx} - 4y = x^6e^x$

b) Solve $(x^2 + y^2)dx + (x - xy)dy = 0$

Q.3. A tank contains 200 liters of fluid in which 30 grams of salt are dissolved. Brine containing 1 gram of salt per liter is then pumped into the tank at a rate of 4 L/min; the well mixed solution is pumped out the same rate. Find the number A(t) of grams of salt in the tank at time t.

Q.4. Solve the given IVP

$$y''' - 2y'' + y' = 2 - 24e^x + 50e^{5x}; \quad y(0) = \frac{1}{2},\ y'^{(0)} = \frac{5}{2},\ y''(0) = -\frac{9}{2}$$

Q.5. Solve the Cauchy Euler equation $x^2y'' - xy' + y = 2x$.

Q.6. Find two power series solution of the DE $y'' + 2xy' + 2y = 0$ about the ordinary point $x = 0$.

----------LK-6743//2-06-2026---(F-24)----------

University of Sargodha

BBA/ADP/ BS 3rd Semester Examination 2026
Paper: Tools for Quantitative Reasoning (URCG-5121)

Time Allowed: 2:30 Hours **Maximum Marks: 60**

Note: Objective Part is Compulsory. Attempt any three Question form Subjective Part.

Objective Part (Compulsory)

Q.1. Write short answers of the following in 2-3 lines each on your answer sheet. (2*12)

i. Define logical reasoning. Why is it important in decision making?
ii. Differentiate between inductive and deductive reasoning with one example each.
iii. Define a linear model and give one real-life example.
iv. What is the general formula for exponential population growth?
v. Solve $2x - 3 > 5$
vi. Define confidence interval.
vii. Why we use t-test over z-test?
viii. Define scatter plot.
ix. A population grows according to the model: $P(t) = 3000e^{0.04t}$ where $P(t)$is the population after $t$years. Find the initial population.
x. Define the correlation.
xi. If the regression equation is $y = 3x + 5$ what is y when $x = 2$?
xii. A sample of 30 students has a mean score of 75 with a standard deviation of 10. Find the 95% confidence interval for the population mean.

Subjective Part (3*12)

Q.2. A researcher collected data on students' study hours and test scores.

Study hours	2	3	4	5	6
Test score	50	58	65	72	80

a. Draw a scatter plot for the data.
b. Comment on the relationship between study hours and test score.
c. Find the correlation coefficient and interpret the result.

Q.3. A population grows according to the model:

$$P(t) = 5000e^{0.03t}$$

where $P(t)$is the population after $t$years.
a. Find the initial population.
b. Find the population after 10 years.
c. Explain whether the model represents growth or decay.

Q.4. Solve for x ad y in the system of equations:

$$2x + 3y = 18$$
$$4x - y = 10$$

Q.5. What is logical reasoning? Explain their application in modern age.

Q.6. A sample of 36 students has a mean score of 72 with a standard deviation of 12.
a. Find the 95% confidence interval for the population mean.
b. State the null and alternative hypotheses to test whether the population mean is 70.
c. Explain how statistical inference helps in decision making under uncertainty.

----------LK-6787/ 08-06-2026 -----(F-22)----------

University of Sargodha

BBA/ADP / BS 3rd Semester Examination 2026

Paper: Expository Writing (URCG-5119)

Time Allowed: 2:30 Hours **Maximum Marks: 60**

Note: Objective Part is Compulsory. Attempt any three Question form Subjective Part.

Objective Part (Compulsory)

Q.1. Write short answers of the following in 2-3 lines each on your answer sheet. (2*12)

i. How is self-reflection related to the writing process?
ii. What is the benefit of having an outline in an essay?
iii. What is clustering?
iv. Define personalized learning in your own words.
v. Explain visual learning style.
vi. What is the difference between skimming and scanning?
vii. How can note-taking help in reading?
viii. What does IELTS stand for?
ix. What role does fieldwork play in community engagement research?
x. What is meant by community engagement?
xi. What are annotated bibliographies?
xii. How can a letter to an editor influence public policy?

Subjective Part (3*12)

Q.2. Explain the importance of self-reflection in the writing process. How does self-reflection contribute to improving writing skills and enhancing personal growth?

Q.3. Discuss the concept of learning styles and how understanding one's learning style can enhance the learning process. How can students apply this knowledge to create an effective learning plan?

Q.4. Peer review plays a crucial role in improving presentation skills. Explain the peer review process for oral presentations and its significance in refining both content and delivery.

Q.5. Discuss the importance of community engagement in academic research. How can students contribute to their local or global communities through research, and what skills are essential for successful community engagement?

Q.6. Identify and explain the different types of letters to the editor. What are the key components of a well-structured letter to the editor, and why is it important to adhere to the proper format when writing one?

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BBA/ ADP/ BS 3rd Semester Examination 2026

Paper: Ideology and Constitution of Pakistan (URCG/URCI-5122)

Time Allowed: 2:30 Hours **Maximum Marks: 60**

Note: Objective Part is Compulsory. Attempt any three Question form Subjective Part.

Objective Part (Compulsory)

Q.1. Write short answers of the following in 2-3 lines each on your answer sheet. (2*12)

i. Ideology of Pakistan
ii. M.A.O College
iii. Lahore Resolution 1940
iv. Two features of India Act 1935
v. Objective Resolution
vi. One Unit
vii. Two provisions of 1956 constitution
viii. Basic Democrats (B.D members) as electoral college
ix. Architect of Presidential Constitution of Pakistan
x. Relationship between legislature and executive under 1973 constitution
xi. Equalization of votes for presidential election
xii. Name of High Courts of Pakistan

Subjective Part (3*12)

Q.2. Write a comprehensive note on political services of Sir Sayed Ahmad Khan.

Q.3. Analyze the services of Quaid-e-Azam in Pakistan movement.

Q.4. Discuss the factors leading to the abrogation of 1956 constitution.

Q.5. Define fundamental rights and also discuss the important rights under article 8 to 28 of constitution of 1973.

Q.6. Describe the significant amendments in Constitution of 1973.

----------LK-6789/ 05-06-2026---(F-24)----------